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OUR ECONOMIC SEA FISHES.

By DR. JAMES MURIE,
Member of the Kent and Essex Sea Fisheries District Committee.

It would seem to be a racial peculiarity of the British community concerning those matters in which ultimately they attain preeminence, that they should, more often than otherwise, only be arrived at through a series of blundering experiences. Expressed otherwise, the English slow-to-move habit and perfect do-as-you-like freedom beget a tendency to let things move in their old circle until personal interests of a few spread to the many. Then follow surging and activity, seldom resting until leeway is made up, and they are abreast of, perchance push beyond, the nations started earlier and more systematically disciplined in the given field. Unfortunately too many examples might be cited, particularly in the political sphere, as well as in those of literature, art and science. Speaking broadly, British efforts, as a rule, have sprung from private individual exertion, the Government only falling in perforce, whereas Continental nations in the main reverse the process.

Our economic Sea Fish and the associated industries are instances in point. Seemingly it has taken a long time to realize and arrive at the conclusion how close is the connection between these and Ichthyology.

When her Majesty ascended the throne, and indeed almost for half her reign, the Cuvierian and Müllerian classifications of Fish,

perhaps with some few exceptions, were alone regarded in the light of science, while study of the useful groups of Sea Fish were little better than meagrely referred to or looked at rather in the light of a trade subject. How could it be otherwise when the genial but distinguished Yarrell was shunted by the Royal Society as only a tradesman and pseudo-scientist?

Yet, after all, though late in the field, it looks as if Fish economy is bound to revolutionize some of the older doctrines current among Ichthyologists. It is a case of evolution in science ; the microscope and embryology have helped Fishery questions over the stile, so that practical or economic Ichthyology—namely, the life-history of our Food Fishes—is the new departure of this branch of Zoology.

There are two circumstances which stand out in relief in the chronicles of commercial Sea Fish. One, the oft-recurring scares as to the decline and probable destruction of the British Fisheries, with repeated Parliamentary enactments thereon ; the other, the antagonism of the fishermen and ichthyologists.

What took place, say, in the sixteenth or seventeenth centuries onwards, is certainly reproduced with but slight variation up to the present date. Forsooth, there has been no want of legislation ; the old Statute Books teem with it. For example :—Catch and traffic in Herring ; preservation of Sea Fish spawn and fry ; width of mesh of nets ; regulations for Pilchard fishery ; grievances of Lowestoft *versus* Yarmouth ; encouragement of British Fisheries ; relations with foreigners *re* Fish and Fishing, &c., &c.—nearly all subjects worrying the Sea Fisheries Boards of to-day as much as they did Parliaments in the reigns of the Henrys, Elizabeth, and the Georges.

The fact is, as in every other trade, that of fishing is liable to fluctuations ; but the problem in this case and the remedies are far more intricate than in an ordinary business. Even the methods of science, as of political economists, hitherto have failed to unravel the laws of, still less to point out modes of relief to, the fishing industries, though there is a dawn, it is to be hoped, of better things in store. Wherefore non-agreement between fishermen and ichthyologists is easier accounted for. Why inquire about common things, our catch, or where a particular sort of fish is found, &c.? It cannot mean business, but may only hide



some design probably against the fishers' interests, therefore interrogators must be baffled. In illustration I may mention that only a dozen years or so ago the streets of St. Andrews witnessed some high jinks. Amidst sounds of merriment an effigy of the Natural History Professor was paraded about and ultimately burnt on the sands. The University don had dared to announce the heretical notion that certain sea-fish spawn floated; they, the fishermen, knew better, and further concluded some evil intention lay in the Trawling Commission. The real victim enjoyed the joke, and went out to witness his incineration. Ask those fishermen to-day regarding the occurrence; they smile at the "lark," but swear by the Professor.

Among the Statutes of Edward III. were those relating to Herring, since which there have been a shower of others, besides Commissions on the same fish. Indeed it has mainly been through this shoal-roamer, the staple at least of the northern part of the kingdom, that in this country the naturalist has been called in as arbitrator—exactitude *versus* loose opinion—and Dr. Knox, Harry Goodsir, and Professors Allman and Huxley have acted as the thin end of the wedge.

In the issue of Couch's 'British Fishes' (1862-64) the author announces as his intention:—"It has been deemed of special importance to give with as much precision as possible an account of the characteristic habits of each species . . . with frequent communications from practical fishermen of great intelligence."

About the same time Bertram, in his 'Harvest of the Sea,' in a prefatory note says he believes his is the "first work in which an attempt has been made to bring before the public in one view the present position and future prospects of the Food Fisheries of Great Britain."

What doubtless in some measure helped in due season to modify the attitude and hasten the change of British scientific men towards Fishery questions was the Norwegian Prof. Sars' discovery (1862) of the floating (pelagic) nature of the Cod's ova as contradistinguished to the sunken (demersal) nature of those of the Herring and presumably of other fishes.

It is due though to Frank Buckland to accentuate the circumstance that for a number of years, in and out of season as the case might be, he kept drumming into the ears of the public, in

his own humorous but vigorous fashion, the importance and necessity of Sea-fishery investigations. His communications more often appeared in 'The Field' and 'Land and Water,' and occasionally from their literary style suggested a smack of the charlatan. But the best evidence of the earnestness and worth of the man was the devotion to his Fish-cultural Museum at South Kensington, ultimately endowed and bequeathed by him to the nation.

A wholesome impetus was also given to fish studies by F. M. Balfour's Monograph on Elasmobranchs, quickly succeeded by his Treatise on Comparative Embryology; Buckland and Walpole's Government Report 'On Sea Fisheries of England and Wales' (1879); Dr. Günther's 'Study of Fishes'; and Dr. Day's 'British Fishes,' but especially Buckland's Appendices (II.-IV.) of Report, pressed home the subject of our Economic Sea Fish.

The fishing industry itself (chiefly Grimsby and Hull trawlers), on account of the moot question of deterioration of the Sea Fisheries, and supposed relation of this to the capture and sale of immature fish, resolved itself into a National Sea Fisheries Protection Association, with affiliated branches throughout the kingdom. Their conferences and public agitation no doubt had considerable influence in after-movements of corporate bodies and the Government.

At this juncture came the Norwich and Edinburgh, followed by the London International Fisheries Exhibition of 1883, with its abundance of foreign and American element; the latter even in certain sections of food-fish and appliances far outstripping the English collections. Much of the Exhibition literature and conferences was of a practical kind, widening yet urging the current of British Fish industry in the new direction.

Still one thing was manifest, *viz.* "That our knowledge of the habits, time, and place of spawning, food peculiarities of the young, migrations, &c., of the fish which form the basis of British fisheries is lamentably deficient, and that without further knowledge any legislation or attempts to improve our fisheries by better modes of fishing, or protection, or culture, must be dangerous and indeed unreasonable."

But the echoes of the consensus of opinion at the Fisheries Conferences, as above quoted, had hardly died away ere the said

defects were being amended. Complaints of the line and drift-net fishermen stirred the Government to a commission of inquiry on the trawl-net and beam-trawl fishery. Its chairman (the late Earl of Dalhousie), supported by Prof. Huxley and Mr. Brady (Inspectors of English and Irish Fisheries), and colleagues were all experienced and energetic. Prof. McIntosh fortunately was appointed "to undertake a series of observations upon the results of the use of the beam trawl-net, and upon the distribution of the food-fishes taken by trawlers upon the grounds which they frequent at different seasons of the year." Thus reaching a climax, one may say, for from the Report of this Commission has sprung that activity and fusion of the interests of science and fish industries in Britain.

The Fishery Board for Scotland (reconstituted from the old White Herring Fishery Board) started into new life. Coincidently and at short intervals thereafter there arose Marine Laboratories, to wit, those of St. Andrews, Granton, Plymouth, Liverpool (Biol. Soc.), and others, and, later on, a Sea-fish Hatchery at Dunbar.

Whilst the Government could not see their way to carry out the recommendations of the 1883 Commission *in extenso*, they yet adopted some of them with modifications, and departmental changes resulted. The Sea Fisheries Act of 1888, taken in connection with the creation of County Councils, was the means of introducing the Sea Fishery District Committees of England. With them, as in the instance of Lancashire, further activity took place in fishery problems, though many of them were already being solved through the active and practical efforts of the Scotch Fishery Board and the Marine Laboratories. In fact, ichthyological science had at length been brought in touch and amalgamated with the interests of the fishing communities themselves, and this partly by some of the County Council's Technical Instruction Committee's organizations.

In brief, then, the Victorian Era, inasmuch as commercial Sea Fish and fisheries' lore are concerned, commenced with a distinct paucity of knowledge of the life-histories and habits of the species. Yarrell's 'British Fishes' may be taken as the starting point, adding Parnell's 'Forth Fishes' as a twin sample of their economy and the local faunas then extant. The Jubilee goal or

opposite extreme presents us with Cunningham's 'Marketable Fishes' and McIntosh and Masterman's 'Food Fishes.' For the first four decades the progress was slow. A few years of interregnum with indications of change of front succeeded. Lastly, fully another decade of rapid issue of quite a different order of fish literature, and information as to their everyday habits, breeding, &c.

I have avoided discussing, except by mere incidental reference, what influence other countries may have exerted in the production of change in our own. As a matter of fact this has been considerable. To continental and American authorities and their governmental action we are primarily indebted for many important investigations and movements in fishery questions. The Cod and Herring breeding and migration, the surface fauna, sea-fish hatching and marine laboratories, besides other matters, have often received their earlier attention, and we in this country, lagging behind, have at last only too gladly availed ourselves of their priority. Our haphazard mode and mere outcome of individual personal interest have obliged us, one is almost ashamed to say, to follow the stranger's leading. That hurry-up of the last decade, as of old, has been a matter of necessity to keep in line with the advance guard. It may be questionable if we are not yet the rear guard in some ways.

To whither we have arrived at in the study of our economic Sea Fishes is best made evident in the pages of the lately published volumes of McIntosh* and of Cunningham,† respectively the product of the St. Andrews (Gatty) and of the Plymouth Marine Laboratories. The authors, while having been active workers themselves in the subjects under consideration, yet avow that their form of book production is but intended as a summary of the most recent and important scientific investigations, otherwise scattered through many British and Foreign Transactions, journals, periodicals, &c.

* 'The Life Histories of the British Marine Food Fishes.' By Prof. W. C. McIntosh and Asst. Prof. A. T. Masterman, University of St. Andrews. 8vo. London, 1897.

† 'The Natural History of the Marketable Marine Fishes of the British Islands.' By J. T. Cunningham, Naturalist, Brit. Marine Biol. Assoc. 8vo. London, 1896.

The contents of the aforesaid Food Fish volumes are ostensibly identical, but their treatment somewhat dissimilar. That from St. Andrews is illustrated by twenty-one coloured plates containing some 250 figures, besides forty-five woodcuts distributed in the text. These represent the eggs, larval and post-larval conditions of the great bulk of our food-fishes. That from Plymouth has 159 woodcuts, and two maps of the fishing grounds of the British Islands and west coast of Europe. The authors freely acknowledge their indebtedness to the many workers of all countries. Besides other subsidiary matter the text deals with the pelagic fauna generally, egg development, and subsequent growth of the larvae to adolescence onwards; but the major portion is devoted to the life-history of particular families and species of Sea Fish used for consumption. All the dry reading on synonymy and the opinions of the early classical or ichthiological writers are dispensed with. Both are excellent epitomes of the methods and results of modern research as adapted to the practical issue of fisheries questions.

No longer is the fish described from a shrivelled or spirit-preserved specimen. Rather is it now studied in the living condition in the aquarium in large tanks, or it is hunted out in its native haunts at all seasons, and frequently even in inclement weather there and then watched and examined in every stage as to age, condition, food, and surroundings. The eggs themselves are fertilized and hatched under the eye of the observer, and from the transparency of the pelagic ova, under the microscope and reagents, every change from fertilization to final hatching can be followed step by step with ease. Thereafter the post-larval changes and habits to adolescence are noted and compared with those of the adults at freedom in the sea.

While it could have been said with some show of propriety in the early eighties that none or very few indeed of our commercial sea-fishes' life-histories were known, now at least it may be affirmed that the great majority of them are tolerably well ascertained. For instance, of the *Gadidae*, take the Cod as being that whose pelagic ova first attracted Sars' attention, and which have since undergone the close scrutiny of several able naturalists. It spawns from February till May, the female carrying from two to nine million ova. These diminutive glassy

spheres, at first scarcely visible, float freely, and in still water rise to the surface. The embryo hatches about the eighth or tenth day. At first the larval Cod are impelled about helplessly, often the yolk-sac uppermost. These tiny fish have black transverse bars, giving them quite a characteristic appearance. In a week's time the yolk-sac is absorbed—the post-larval stage—and the barred pigmentation becomes tesselated or tartan-like. The future back and belly fins are originally continuous membranes. When about three weeks old the head becomes pigmented, while the body assumes more of a greenish yellow hue. Shortly after there is budding of ventral and separation of dorsal fins, and a tendency to longitudinal pigmentation of the body. When arrived at about an inch long or over, the fish has assumed quite an adult facies, with barbel and fins complete. From the rock-pools and upper water they descend among the shore algæ. By the late autumn they are four or five inches, and by the spring a foot long. A seaward migration then takes place, and in their third or fourth year they return in immense companies as full-grown Cod.

Sexual maturity, according to Holt, is when the Cod are from twenty-two inches to three feet long, though McIntosh is inclined to deem twenty inches a fair average. Quite a variety of annelids, crustaceans, and fish form the Cod's diet; but it is a most voracious, indiscriminate feeder.

The embryology, post-larval up to the adult stages, of other members of the Cod family have in similar manner received assiduous attention. Besides the movements, the food and the everyday life of the fish themselves in their marine habitat have been carefully watched on all parts of the British coasts, both within (shorewise) and beyond the territorial limits. Thus a mass of evidence and information has accrued, practically instructive alike to fishermen and scientific seekers.

The young Ling undergoes remarkable transformation in colour and in curtailment of ventral fins, which in the early stage are relatively of enormous length. The eggs of the Torsk and Ling are distinguished by a great oil-globule, which renders them more conspicuous in the water than those of their allies. The Haddock, and to some extent the Whiting, keep to deep water offshore grounds till reaching five or six inches in length, when

they take to swarming in the inshore and estuaries—in this respect the opposite of the ways of the Cod.

With regard to the *Clupeidæ* (Herring family), McIntosh and Masterman say that:—"In the case of the four common Clupeoid species—the Herring, Sprat, Pilchard, and Anchovy—the most superficial examination of their eggs with the naked eye is sufficient to distinguish them. The opacity and thick adhesive membrane of the first, the translucence and delicate capsule of the second, the clear peri-vitelline space and oil-globule of the third, and the unique shape (ovoid) of the last are all characters readily recognizable without the assistance of the lens."

Size alone distinguishes the Gadoid eggs. The Herring's egg belongs to the sunken type (demersal), a feature not shared by its immediate family allies, nor of the Cod and flat-fish families; these groups embracing the chief economic British fishes. It is this very exceptional circumstance, together with the occasional eccentric periodic migratory habit of the fish itself, that has compelled the Government repeatedly to recognize the necessity for inquiry into the creature's ways, as a matter involving the nation's fisheries' welfare.

The fluctuations in the Herring fishery can scarcely yet be satisfactorily accounted for, though the hue and cry against trawling is met by the reply that the spawning areas, so far as is known, are not those usually frequented by the trawlers.

There is a slight excess of males among Herring. The female carries from 20,000 to 50,000 ova. Spawning time varies round the coast. Experiments instituted by Dr. Meyer, of Kiel, and corroborated by other observers, prove that temperature of the water materially influences the hatching process. Though seven to ten days is the normal period, cold may vary this to forty days, and *pari passu* the size of larvae. When first hatched the larva is more advanced than in the Sprat, a buoyant egg-form. The larval Herring has a biggish head, attenuated colourless body, and the gut passes to proximal tail-end; a broad fin-membrane extends posteriorly from yolk-sac uniformly over back and belly. In the early post-larval stages growth is lengthwise, thickening of body not increasing in the same ratio. There is yet absence of scales or silvery sheen. Later on, however, fins differentiate, the anus acquires a more forward position, the body deepens,

fine pigmentation appears, and shortly afterwards the silvery hue commences—the Whitebait stage.

McIntosh and Masterman thus summarize the early Herring :—“ The young larva, hatched at from 5 mm. to 7 mm. in length, lives near the bottom till about 10 mm. is attained by a rapid increase in length. The attenuated post-larval Herring then migrates upwards through the mid-water to the surface, the mid-water stage lasting from about 10 mm. to 23–24 mm., and the surface stage from 24 mm. to 27–28 mm. [roundly speaking, one inch or thereabouts], when a movement shorewards takes place, and the littoral habit is acquired.”

Their further increment and subsequent erratic movements are a more tangled skein to unravel. Growth and maturation are complicated and confused by a double spawning period. Data give a length of three inches the first twelvemonth, to five inches the second year, and to eight or nine inches the third year, when sexual maturity is attained ; but British and foreign observers are not quite in unanimity thereon. It would appear though that in the case of the Baltic as well as British Herring there are two marked spawning seasons, the so-called winter and summer Herrings. The same Herrings, however, do not spawn twice annually, the summer and winter stock being races apart, whose spawning localities essentially differ. Winter spawners frequent inshore brackish waters, whereas summer spawners are more strictly sea-dwellers, coming near the coast, but not into estuaries at spawning season. The Clyde, Forth, and Plymouth Herring are winter, the North Sea group summer breeders. The former estuarine fish come and go within a limited area, the latter offshore have a wider sea migration. In both cases, though, it is a see-saw towards and away from the coast, the so-called summer Herring spawning in deeper water further distant from land.

The supposed mystery of the fish returning to their own special grounds, Cunningham thinks is due to their habit of herding in shoals. Temperature and food drive the fry up an estuary, and there as they grow, meeting older brethren, associate and accompany them back to the sea-spawning ground.

Of other Clupeoids, it is singular that the Sprat is much more used as an article of diet in England than in Scotland, though to

be found equally abundant in both. According to McIntosh Sprats spawn well up reaches in estuaries, but Cunningham avers that spawning occurs in the deep water. From such data it may be inferred that they have a summer and winter spawning season in different areas like the Herring. Yet there are manifest physical differences in their entire career. In the Sprat the female but carries 5400 ova; the eggs are pelagic, though inclining groundwards, and they are markedly reticulate; incubation short, three to four days; a slower larval and post-larval development; at the early stage mouth closed and absence of pigment in eyes and body generally; transformation at $1\frac{1}{4}$ in., about a year old 2 in. or 3 in., and the sexually mature stage 4 in. to $4\frac{1}{2}$ in. long, *viz.* two years of age.

The Pilchard essentially is only a south-west British form, and its winter home the English Channel. They are rarely caught in the gravid condition; their ova count some 60,000. They spawn far off shore. The egg is typical of those that float, but unique in possessing a large egg-membrane space, a segmented yolk, and an oil-globule—these three characters not being united in Clupeoids or other families. Incubation takes four or five days. The early larva is one-seventh of an inch long, the yolk still large, the mouth closed, and pigmentation sparse. At three days the mouth develops, at five days they feed, are one-fifth of an inch long, and the yolk absorbed. At the Sardine stage, four inches or over long, they are about one year old, and they are sexually mature at two years of age, then being eight or nine inches long. The Anchovy is also chiefly a southern British form, and for it there is no regular fishery; but that of Holland, on the contrary, is very valuable. Cunningham infers that the Dutch Anchovies retreat in October towards the English Channel, the same again migrating north in the spring to spawn. Their sausage-shaped egg is quite exceptional among floating eggs. The Shads have the Salmon habit of running right into fresh-water streams, where they spawn. They are less a food product in this country than in America, where Shad hatcheries are quite in vogue.

The *Pleuronectidae*, or flat-fishes, nowadays holds a high position in the English fish-trade. Not being used in the salted condition, formerly their consumption was restricted coastwise;

but after the introduction of trawling into the North Sea, of steam, and especially railways, with the use of ice, they regularly found their way to interior markets in quantity in the fresh condition. Herring and Cod of yore were the grand staple of fish-trade in this country and the Continent ; yea, much rivalry and many a pretty local and international quarrel arose thereon. Even yet witness the Newfoundland grievance.

There are quite a number of species of Pleuronectid food-fish in household use. If not individually of the most intrinsic value, yet collectively the Plaice probably heads the list in mercantile superiority. Its life-history consequently has received due attention. Broadly speaking, the old fish are quite offshore dwellers, whereas the young are estuarine, bay and sandy shore frequenters. The cycle pursued is thus traced. The ovary may contain from 250,000 to double that number, the spawning process being by driblets. It is the earliest spawner of the flat-fish, commencing in January or prior to that date. The egg, of large dimensions, is pelagic, with striated capsule and minus oil-globule. Incubation varies according to temperature, &c. At St. Andrews, in April, eight or nine days ; at Dunbar, in January, sixteen to eighteen days ; at Granton, in (?), twenty-seven days. The newly-hatched Plaice resemble the Flounder and Dab, but are larger, *viz.* about one-fifth of an inch. The mouth is closed, the gut opens immediately behind the yolk, pigmentation is diffuse, the eyes are on each side of a deep, vertically compressed body, and there are broad marginal fin-membranes. From larval to post-larval stage there is a gradual descent from surface to mid-water, and then to bottom. Then turning upon their left side, this loses its pigment by absence of light, whilst the left eye begins to pass towards the right one. Meantime the young fishes by degrees travel shorewards. When verging on half an inch long the body broadens, the eye has got well towards the right, the dorsal fin has advanced to its hinder border, the lateral line looms up, and brown pigment is diffused throughout the upper or right surface of the fish. Growth meanwhile proceeds apace. When a couple of months are over it may be about one inch long, at eight months three inches, a year old four and a half inches, when sixteen to eighteen months reaching about six inches long. Towards the end of second year it averages ten inches, and in the spring of

third year it arrives at sexual maturity, say, twelve to fifteen inches ; though growth continues thereafter, Plaice of thirty inches being recorded. There appears to be a northern large and southern small breed of Plaice, a circumstance confusing in legislating on size limits for market purposes. Experiments by the Scotch Fishery Board officials in St. Andrew's Bay and Firth of Forth prove that the young Plaice travel in definite directions. From seaward where let free a semi-rotary course was followed by south shore westerly, then by north shore easterly, towards their spawning grounds ; many specimens spent a long time in traversing the route. This tallies with Holt's observations on the opposite shore of the North Sea. There the currents trend to the Heligoland bight, the ova floating in that direction, where the post-larval fish spend a period, again to return to the offshore spawning areas. Their chief food is molluscs of various kinds and marine worms.

The Sole has had a finely illustrated monograph devoted to it by Cunningham (Mar. Biol. Assoc.). In this its embryology, adult structure, and economy are fully treated, and various species of *Solea* meet descriptive notice. The egg, very characteristic, has a ring of minute oil-drops and a segmented yolk. Incubation lasts four to ten days. The larva is hardy and restless ; the post-larval changes in the main resemble those of the Plaice. At nine months it is two and half inches, a year old six or seven inches, second year nine to eleven inches, and third year nine to fifteen inches long. There is a migratory movement analogous to the Plaice, but Soles seek the deep water during cold weather, and *vice versa*. The Turbot, though not an abundant fish, would seem prolific, judging from its one to ten million ova. Eggs hatch in six or seven days. At their later stage these assume quite a red appearance, and this pigment coloration is a marked feature of the larva, though soon changing to orange hue. In the post-larval stage the head has a spine armature, which afterwards disappears. Few of the Turbot's pelagic ova are found either offshore or inshore. It spawns offshore, where the larval and post-larval stages are spent ; in their later youth they disport themselves inshore, but when ten to eleven inches they again seek the deep water. Its predacious Herring-feeding habits keep it moving after these vagrant fish. The Brill spawns earlier than

the Turbot, but their development and habits throughout closely resemble each other. The Brill is likewise a fish-eater, Sand-eels, Sprats, and smaller members of the Cod tribe being its chief fare.

The Halibut, king of *Pleuronectidae* in size, when about a foot long, are occasionally found shorewards, but the adults are quite deeper sea dwellers, and are fish and crustacean feeders. The Flounder, though closely allied to the Plaice, differs widely in habits and migration. It arrives early at maturity, and is exceptionally fecund. There is much disparity in the sexes, the females largest, the males most numerous. It is quite estuarine in habit, a mud, sandy shore lover; but it ascends and dwells in rivers quite to the fresh-water mark, though the adults migrate seaward to reproduce. The Dab has an exceedingly small egg; it is not a prolific fish, and the male is smaller than the female. They are not sexually mature till the third year, growth thereafter being slow.

Of other families of British food-fish, the Mackerel doubtless is most important, but unfortunately the chapter in its life-history is still wanting in several particulars. The Red Mullet is remarkable inasmuch as in the larva the "yolk-sac projects far beyond the front of the head, and the oil-globule is placed at the extreme end of the projecting portion," a feature, however, in part shared by the Comber or Smooth Serranus. The Bass, the Grey Mullet, the Skates and Rays (the poor man's food), and Conger and some others, are each and all of considerable consumption; but it is enough to say that modern students of piscine biology are at present trying hard to unravel that ancient mysterious puzzle, Whence the Eel and Conger?

The whole scope and essence of this new-born Food-fish study resolves itself into the *elucidation of general laws applicable to the finny tribe*. It is thought that by the aid and exactitude of modern scientific appliances and methods this may be attained, and the knowledge imparted to the fisher fraternity themselves. Towards such inquiry there is wide scope, for living things, physics, and variety of surroundings lend complexity. It is not easy then to gauge the respective influences and their values, and formulate laws accordingly. Hence where certain difficulties

present themselves there is a loose tendency to phylogenetic speculation. This last may temporarily satisfy our ignorance, but yet is an unstable platform to rest on where practical issues are at stake.

Necessarily many of the researches now in progress appear superfluous or insignificant, but science abounds with instances of seeming trifles leading to unexpected beneficial results. It cannot be affirmed with absolute certainty that there has been material increase in British fisheries since the advent of the laboratory and out-of-door investigations. But there is no gainsaying the fact that a sound foundation has been laid for a study of their economy; witness McIntosh and Cunningham's volumes aforesaid. Take, for example, investigations of embryotic and post-larval conditions: it is a long jump from 0 to over eighty species to be recorded.

The spawning grounds, the periods of spawning, and the varied lengths of the spawning process in different fish, are in many cases far better understood, whilst it is pretty well proved that temperature has a manifest effect on the duration of hatching, a fact established by Higginbotham (1850)* in experiments on the Frog, and now shown likewise to be the case in fish-eggs. Migratory habits are gradually getting law-evolved. As to cases in point, there is that of the to-and-fro movement from offshore to inshore, and the reverse. Of a certainty it can now be said of some fish, that on hatching the larva and post-larva uniformly and gradually make for shore or shallow water, there to spend their young stage, to retreat again to deep water on becoming older, and this in a definite course. There is regular congregation and migration during spawning season, partial dispersion thereafter. Search for food assuredly induces wandering habit, and atmospheric changes drive to greater depths. The factors conduced to erratic wholesale emigration, or the sudden departure from a long frequented spot or area, each fish's particular enemies, and their diseases aside from effects of parasites, are still *sub judice*.

Probably there is no more promising field still requiring exploration on British shores than that of the surface organisms,

* The circumstance was known, however, to Spallanzani, Rusconi, and others, in *Amphibia* a century ago.

and this is likely to yield substantial data to clear up several of the knotty fish problems. McIntosh kept a record for a year of those pelagic fauna found in St. Andrew's Bay, and the monthly variation is most interesting and instructive. He compares the whole to a spindle, the thick mass corresponding to May-July, therefrom tapering on either side to the ends=January. To these surface forms, as a whole (plants and animals), Hensen has applied the technical term "Plankton" ($\pi\lambda\alpha\gamma\kappa\tau\circ\acute{s}$, wandering).* He believes the economical food yield of the ocean can be statistically determined by quantity. Without here questioning his theory, one doubted by Haeckel, it certainly is more obvious that there is an intimate interdependent relation between marine life and seasonal fish numbers. This through plants furnishing pabulum to invertebrates, and these again to piscine groups. To pursue the links in the chain further, the plant profusion is determined by meteorological conditions, and we have arrived at physical causes more within our ken, and probable after results determinable beforehand. Thus step by step are we likely to arrive at reasons for the annual gluts or dearths of fish, early or lateness of seasonal appearance, food migrations, &c. The more pressing or immediate interests of fisheries' industries, meanwhile, have not been lost sight of by the scientific inquirer. Much has already been accomplished towards ascertaining the limits of sexual maturity in both sexes, and the vexed questions of trawling and temporary closure of areas have received due attention. Into these I do not propose to enter other than by pointing out the assumption (a fashion revelled in by the younger biologists) that our fishing is producing a stunted race of flat-fish (?).

The institution of Sea-fish Hatcheries, so extolled in America, is yet on its trial in this country. Opinions thereon are divided, the balance being rather in favour of those who maintain the Scotch verdict of "not proven." It is questionable whether the working of a hatchery could be made profitable or not. The weak point in the Dunbar hatchery is liberation only in the fry stage. To remedy this defect, what in contradistinction may be termed "nurseries" are suggested. In these, with larger enclosed

* The German remarkable "Plankton" Atlantic Expeditions are object lessons.

areas under suitable more natural conditions, the fish could be retained until older and better able to avoid enemies when set free. From the foregoing statements it may be allowed that research has passed beyond probability, and a tangible result obtained, though still more is wanted ere rational legislation and full benefit accrue. To get this within reasonable time additional State aid seems necessary, for, as the nation generally is to benefit, it is not the *rôle* of private adventure.

We have four University Marine Biological centres. Port Erin (=Liverpool), with voluntary workers, does a fair share of investigation, chiefly, not exclusively, of a local character. The Lancashire County Council contribute towards sea fisheries and technical instruction, otherwise all is private energy. At Plymouth (=Oxford) the researches carried on are of a high standard. The Treasury grant £1000 a year, and the Fishmongers' and Drapers' Companies in round numbers £500 without equivalent. Other funds come from sale of specimens and admissions of public, &c. Most unfortunately this station carries a "white elephant," *viz.* a building of huge proportions and officials proportionate. This I strongly warned the originators to avoid, but Naples was the model taken, and my advice was disregarded, though now, I fear, discovered too late. It was started with a very large fund (£12,000), but it is to be regretted it suffers from the initial error. Milport (=Glasgow) heretofore has been modest in its aspirations and gratuitous in its labours, though it is advantageously situated towards the peculiarly deep salt-water lochs worthy of further study. St. Andrew's (=Gatty), the first started in Britain, has all along been hampered by paucity of means. For some time the Scotch Fishery Board allowed a slender annual donation (for their fisheries purposes—said donation now withdrawn); otherwise all its high-class work has been solely by private energy. Nevertheless for deeds accomplished she has worthily stood abreast of her more favoured southern rival. Lord Reay* puts it in a nut-shell when he says: "There is one feature . . . of which I can speak without being

* Address at the opening of the new building (Marine Laboratory), generously presented to the University of St. Andrews by the Rev. C. H. Gatty, East Grinstead, Kent, 1896.

specialist, and that is the extraordinary economy which has been practised."

With this Jubilee year, and the stock-taking of the Victorian Era, on comparing the mother with her daughter colonies, and with other nations whose fishing industries are relatively less than our own, it stands out that the British Government only lukewarmly responds to the science requirements of the most important national Sea Fish food question in its broad aspect. Hence the time has arrived, if we are to keep place in the race, when a further impetus might well be given to speed the good efforts in this direction. It behoves moreover that distribution of funds should be so judiciously spread that Universities' heart-burnings be moderated, withal stimulated.

THE BREEDING HABITS OF THE PURPLE HERON.

By F. B. WHITLOCK.

IN May of the present year I visited a certain district in France where the Purple Heron (*Ardea purpurea*) breeds in moderate numbers. As my experience of the nesting habits of this species differs in some respects from previously published accounts, a few notes should not prove uninteresting.

The district to which I refer should be a paradise for Herons, as numerous large ponds or meres, of one, up to many hundred acres in extent, are scattered over a wide extent of country. All, however, are not favoured as breeding-places by the Herons, and it is only in those which are covered by a dense forest of reeds and other aquatic vegetation that colonies are found.

In a mere of about one hundred acres, occupied by one vast reed bed, and where in the few open spaces round the margins I found the lovely white water-lily growing in profusion, I observed Herons rising at intervals from the thickest portion of the reeds. Having been told that a colony existed here, I determined on making a closer examination. The only plan appearing to be to wade out and force a passage into the reeds to the part to and from which the birds were passing, I naturally carefully took my bearings as I sat on the bank eating my lunch. Once amongst the reeds I could only trust to my sense of direction, as they grew to a height of seven or eight feet above the water. I was glad to find when I commenced to wade that the depth of the water rarely exceeded four feet, and that underfoot was a good firm bottom free from mud.

It was laborious work pressing through the reeds with a mass of vegetation round my waist, and a long tail trailing behind, not to speak of the hot sun overhead, and I must have travelled quite two hundred and fifty yards before putting up a Heron a little distance away to my right. Turning in the latter direction, I found, after five minutes' search, a large nest containing eggs.

Further explorations revealed seven more; two of which, however, belonged to *Ardea cinerea*, the remainder to *Ardea purpurea*. The nests of both species were identical in structure, and were formed entirely of the dried stems of the surrounding reeds. They were rather shallow, but very bulky; one would have perhaps filled an ordinary clothes-basket. The foundations of the nests rested on broken-down reed-stems, and were on a level with the water. Standing by the side of one I could just comfortably get my chin over the rim of the nest. Those of *A. purpurea* contained 6, 6, 6, 5, 5, 5 eggs respectively; but those of the larger species, in one case, had young, perhaps a week or ten days old; and the other, three young and two unhatched eggs. This was on the 11th of May. The eggs of *A. purpurea* in several cases were quite fresh or nearly so, and in others incubated for perhaps a week or thereabouts. Each nest stood in a little clearing, due, as I surmised, to the materials having been gathered by the parent birds close at hand. The Purple Heron appears to be a close sitter, for on my invading the colony the owners did not rise in a body, but got up singly as I approached the nests; though on one occasion when I blew a whistle to re-assure an anxious companion on the bank, two rose very precipitately, but without any cry betokening alarm. All flew off, indeed, without any sound or protest, nor did I hear a single cry from the flock of forty or more individuals, which my companion counted, circling around some two hundred yards above the mere. Some of the latter must have gathered from the surrounding country, as I did not put up anything like this number from amongst the reeds.

In the part of France to which these notes refer the Purple Heron is much commoner than its larger ally, and I estimated that fully ninety per cent. of the Herons I observed were *A. purpurea*. The latter species is readily distinguishable from *A. cinerea*, even at a distance, by its smaller size and by its distinctly reddish appearance, due in part to the rufous colour of the scapular plumes, and also to its chestnut under parts; whilst close at hand the black stripe down the sides of the neck in contrast with the clear grey neck of *A. cinerea* is very conspicuous.

Most of our recognised authorities,—Dresser, Seebold, Yarrell, Saunders, &c.,—in writing on the nesting habits of the

Purple Heron, quote the account by Lieut.-Col. Irby of his visit to a colony in the south of Spain. It is interesting to learn that the latter ornithologist only found three or four eggs in each nest, in the place of five or six in my own experience. Abundance of food may perhaps account for the greater fecundity of the Herons I came into contact with, for Dresser states that the Purple Heron is said to devour large numbers of young Green Frogs (*Rana esculenta*). Now these creatures abound in the large ponds before mentioned, and the Herons must have no difficulty in eating their fill throughout the nesting season. Some divergence of opinion may be noted on the dimensions of the eggs of the present species. Seebohm states that they are indistinguishable from those of *A. cinerea*, except that they are *slightly* smaller. He gives the following measurements: length 2·45 to 1·95 in. by 1·75 to 1·45 in. in breadth. Dresser states that eggs taken in Hungary varied from $2\frac{4}{15} \times 1\frac{23}{40}$ to $2\frac{10}{40} \times 1\frac{27}{40}$ in. The average dimensions of eggs of *A. cinerea* the latter author gives as $2\frac{1}{2} \times 1\frac{27}{40}$ in. Saunders, in his 'Manual of British Birds,' states that average eggs of *A. purpurea* measure $2\cdot2 \times 1\cdot5$ in. These dimensions I find approximate to the sizes of the eggs I took in France; my largest specimen being equal to $2\cdot23$ in. in length by $1\cdot62$ in. in breadth, and my smallest but $1\cdot95 \times 1\cdot47$ in. An attenuated egg, however, has a length of $2\cdot30$, but a breadth of only $1\cdot50$ in.

Comparing these measurements with those of eggs of *A. cinerea* kindly supplied me by Mr. R. J. Ussher, who has had considerable experience with the latter species in Ireland, I think it may be laid down as a general rule that large eggs of *A. purpurea* in size rarely overlap those of small ones of *A. cinerea*. According to the above-named ornithologist, eggs of *A. cinerea* vary between $2\cdot63 \times 1\cdot71$ in. and $2\cdot39 \times 1\cdot7$ in. These dimensions, I may say, tally with those of eggs in my own collection.

THE AUTUMN SONG OF BIRDS.

By O. V. AFLIN, F.L.S., M.B.O.U.

MR. CHARLES A. WITCHELL, in a communication in the August number (p. 358) referring to a paper by me on "The Autumn Song of Birds" ('Zoologist,' 1894, p. 411), states that I classed the Robin and Starling with the Thrush and Hedgesparrow as commencing to sing in November, or even in October; and Mr. Witchell adds: "But the two former birds begin their autumn song (if such it be) in August, or earlier." This only presents a part of my meaning, and, I think, misrepresents that. What I really said, as anyone who reads my paper should see, was that the song which the Robin and Starling began to sing in November, or even in October, was "not an autumn song, properly so called. It is the beginning of their ordinary song, which they will continue through the following spring." And on page 411 I stated that "The Robin's autumn song is of course familiar to everybody." This last is the song which is heard at the beginning of August or the end of July.

Since writing my paper, I have twice heard the Blackbird singing in autumn, *viz.* on Sept. 1st, 1895, and Nov. 22nd, 1896; and probably on both occasions it was singing the autumn song properly so called. On the second occasion a bird sang for some time just before sunset (it was a very mild day); the notes were rather poor, but numerous; perhaps the singer was an early-hatched bird of the year. A correspondent has sent me notes of a Blackbird singing on October 19th and 20th and December 28th. But I feel sure that these four are only very exceptional cases. The same correspondent sent me a note of Blackcaps singing in a very low and subdued tone on September 5th and 8th; and I may add that in the first days of August this year I heard, at close quarters, a Blackcap singing a few notes in an undertone in the intervals of eating my fruit. But these feeble attempts cannot be compared with the autumn song uttered by some other birds.

I cannot quite agree with the latter part of the statement that the Willow Wren "is the most persistent singer of all our summer visitors, not ceasing until the middle of August." The Willow Wren, in my experience, becomes silent soon after the middle of June. The time varies a little in different years and different localities, and probably some may be heard singing very early in the morning in the first days of July in some years; for, like certain other birds, it sings in the small hours after it has ceased to sing in the daytime. But during the greater part of July it is silent. So far from ceasing in the middle of August, it is about that time (I said about the second week in my paper) that it strikes up its autumn song. I heard it this year on August 17th, and again yesterday (August 22nd). The Chiffchaff, whose spell of singing lasts from the end of March (the third week sometimes) until the last week in July in some years, does not open the autumn song so soon. In 1885, however, I heard a Chiffchaff on August 15th. In 1883 it was singing on October 1st. I have heard the Wren in September, also in the first week in August. The Starling often sings a little at the end of summer and in early autumn; for instance, on August 19th and 22nd this year.

The early autumn seems to be the only time of the year when the birds enjoy leisure and plenty. After the winter, when they generally have to work hard for food, come courtship, nesting, rearing young, and moulting. But when the last is over, it seems natural that in the warm hazy days of early autumn, when the birds have plenty of time to bask on the tree-tops and tall hedges, they should sing in a lazy, contented fashion. Also that the young birds of the year should try their voices, and produce weak and imperfect strains. Even the Rook adopts a soft caw; but I do not at this moment remember having heard in autumn the softer quavering croak which the Carrion Crow assumes in spring.

TAXIDERMY—*DE OMNIBUS REBUS.*

BY OXLEY GRAHAM, M.A., M.B.O.U.

AT my suggestion that a small portion of 'The Zoologist' should be devoted to the above science in all its branches, whereby many who, like myself, are deeply interested in the matter could exchange ideas and views to our mutual benefit, the Editor has most courteously replied as follows:—"I am entirely in sympathy with your views respecting the admittance of taxidermal notes into 'The Zoologist.' I cannot imagine a science of zoology which is not dependent more or less on some knowledge of animal preservation: now, as to method! I will devote a section of our Notes and Queries to Taxidermy and Preservation of Animal Specimens, which will focus correspondence. . . . The difficulties I see are possible lack of contributions on the subject, and confining it in a purely non-professional area." With regard to contributions, I venture to hope that these will be ample, for most naturalists, be their speciality what it may, are of necessity to a certain extent collectors also. Few dwellers in the country have access to a well-stocked museum containing all the types and varieties of whatever branch of zoology they happen to be specially interested in, and therefore they either preserve their own specimens, or get a professional to do it for them. To many people the term collector is synonymous with exterminator, and I am sorry to say that in numerous cases this is only too true, and it is owing to the greed and the search after £ s. d. of these so-called naturalists that many of our rarer species, both of fauna and flora, are rapidly becoming exterminated; but I am writing now of the naturalist in the truest sense of the word, who only collects where there is the certainty of an ample number of living specimens being left, and where, through accident or otherwise, various rarities from time to time fall into his hands. Surely in such cases as these no one can find fault with the wish to preserve and save from decay any

species of the animal world in the nearest approach to its original form and beauty, for when so preserved they are a lifelong delight to their owner and to others of a kindred spirit. Then with regard to the professional taxidermist, of course it is only right that as he has his living to make by the business he should be chary of gratuitously imparting his skill and knowledge to others; but the day has gone by when the knowledge of these things was held only by a few, and every first-class professional man is always ready and willing to give instruction for a reasonable *quid pro quo*. I could name one or two, regular readers of 'The Zoologist,' who, if I mistake not, would gladly contribute on the matter, as it is one thing to be told how to do it, and quite another to do it. No one can hope to succeed who has not infinite patience and a love for his work, and then indeed practice makes perfect. In these days when Taxidermy has been raised to a high art, as witness the beautiful cases in the national collection at South Kensington, where every detail is made as true to nature as possible, there is no room for bad work. It is as easy to be accurate as the reverse, but many men who can set up a bird passably well as regards form, fail lamentably in those niceties of detail, inattention to which completely spoils a specimen. How often does one see birds placed in impossible positions, legs and beak painted the wrong colour, the tint of the iris completely ignored, fearful and wonderful productions called rockwork covered with all sorts of impossible leaves and plants and bits of variously coloured glass, birds in winter plumage cased amidst summer surroundings, and *vice versa*, and even the breasts of sea-birds whitewashed! *Quot homines tot sententiæ*, and so with Taxidermy: one man opens his birds up the breast, another under the wing, and another down the back; one uses soft stuffing entirely, another a hard body exactly the size of the one he has removed from the skin, and another uses a combination of the two, and as in the hands of a past master each method is capable of producing excellent results, everyone must choose for himself. With regard to preservative powders,—liquids, soaps, &c.,—their name is legion, from the most deadly to the equally efficacious though most harmless. Most professionals pin their faith on the deadly ones; one man that I knew had his finger-nails eaten away, suffered from salivation, and the usual concomitants of mercurial poisoning,

from using corrosive sublimate with the greatest carelessness; and another, a well-known north country birdstuffer, had to give up his work for a long time owing to arsenical poisoning. Never shall I forget one day when, on calling to see him in his workshop, I found him in a cloud of powdered arsenic, dusting it on by the handful. Needless to say with me it was a case of "*Erupit, evasit, as Tully would phrase it.*" I bolted as fast as I could. My remonstrances were of no use until he found his health failing, and then he took to equally good but less suicidal preparations.

There are several excellent works on the art nowadays, both English and American. When I began as a boy to skin and mount specimens there were very few, and they generally contained a great deal that was new and a great deal that was true; but, as some philosopher has observed, unfortunately that which was true was not new, and that which was new was not true. To my thinking, the best of the lot was Captain Browne's 'Manual of Taxidermy.' As I write I have not my books by me for reference, but, if I remember rightly, he inculcated very truly at the head of his list of preservatives,—

"Contra vim mortis non est medicamen in hortis,
Against the deadly moth can I from herbs no remedy supply."

Of course, no matter how well a bird is done, it is impossible to make it exactly true to nature. Take a Knot, for instance, as one sees it puffed out in a round ball, standing on the mud-flats. Perfection is not to be attained in this vale of tears, but still we can approach closely to it, and there is a very great satisfaction in preserving and mounting one's own specimens, when a very great deal more can be learned about them than could otherwise be done, for one is led almost unconsciously to study their various natural attitudes, &c., and the various little details that go so much to enhance the value and beauty of a specimen. There is nothing done without hard work, but in this, as in everything else, if a man means to succeed, he will. There is nothing like beginning early, for a boy does not take it so much to heart as one of maturer years, when, after having spent hours over elaborating a specimen, bird or animal, and having completed it to his entire satisfaction, a kind friend on being shown it remorselessly picks it to pieces from head to tail, metaphorically

speaking, till it literally hasn't a leg to stand on; and as soon as his back is turned, the unfortunate artist kicks it out of the window, or plays hockey with it in his despair and rage. I have been through the mill myself and I know what it is, and, though decidedly unpleasant at the time, it certainly does one good. At the present day when natural history is becoming so popular, when there are numerous small and great societies, each of which has its periodical meetings for the exhibition of specimens, &c., it is a very great boon to the members thereof to know how to mount the various objects in which they are interested in a proper permanent and scientific manner, and so far as I am aware there is no periodical or magazine which regularly opens its pages for the discussion of matter of this kind. To do so embraces a very wide range, and a variety of subjects. One man collects the eggs, another preserves the whole or part of the skeleton of a bird, another keeps the skins for reference and comparison, and the fourth mounts his birds in natural attitudes. The same with the collector of mammals and fish; another may go in for casting models of his special objects. Then there is the question of suitably casing and housing all these treasures, and preserving them from the ravages of moth, dust, damp, &c. Nor is it only with Vertebrate Zoology that Taxidermy is concerned; there is the setting of insects and their larvæ; the preserving of shells, starfish, crabs, *et hoc genus omne*; the use of spirit for many of the lower forms of life; and many more objects of the animal world and methods of preserving them, all of which are included in the comprehensive title of Taxidermy. Therefore I venture to hope that, as the pages of the 'Zoologist' have been so courteously opened to us for the discussion and interchange of ideas and methods in connection with the preservation of the various members of the animal world in its broadest sense, there will be no lack of contributors to the matter in hand. In this, as in most things, an ounce of practice is worth a pound of theory; and to a beginner I would say, have a few lessons from a careful first-class man, and you will learn more than by reading the best book on the subject in existence. It is when one has acquired some practical knowledge of the matter that books—good ones that is—and the interchange of ideas with others, becomes of the greatest use and assistance. One word more. I

do not for a moment wish to pose as a first-class taxidermist myself, and I write rather to obtain information than to give it. One has to specialize in this as in most things, and a man is seldom found equally good at mammals, birds, and fish ; but I am exceedingly fond of the art, and if those of my readers who have the same tastes as myself have derived as much pleasure from so harmless and instructive a hobby as I have, I think they will own that they have no very great grounds for complaint.

GARDEN LISTS OF BIRDS.

BY THE REV. MURRAY A. MATHEW, M.A., F.L.S.

MUCH might be ascertained concerning the distribution of our British Birds, of which we are still very far from possessing a full knowledge, by close observation of them for a series of years in such limited areas as are provided by the gardens and pleasure grounds immediately surrounding our houses, if lists were kept of all the species seen, not only of those that constantly occur and nest, and of all occasional visitors, but even of those that are identified flying over, with dates and other particulars. These lists should be headed with a description of the environments, whether wood and copse, or meadow and pasture, &c., with the elevation above the sea, how far distant from water in the form of brooks, rivers, and ponds, or from the nearest point of the coast, arm of the sea, or tidal river, which might be expected to be a flight-line of migrating birds. If carefully kept, such lists would prove of great service for exchange or comparison, and might be forwarded to ornithological correspondents in other parts of the kingdom, who could send their own in return. Having kept such lists for the last thirty years in the three different homes which I have occupied in succession, each for nearly an equal term, and each surrounded by about the same extent of garden, it would appear from them that any observer in a similar area might expect to be able to record at least seventy species of our British Birds as visiting it; while, if he lived near to a tidal river or to a large wood, he might count upon a considerable addition to that number. In submitting my own lists, I am hoping to encourage the rising generation of bird lovers, and can assure them that the patient watchfulness requisite for their compilation will afford much pleasure and interest. Of course the greatest accuracy must be aimed at, and no species be entered unless its identification be complete. Even now, it is with a keen feeling of delight that I return to my house to note

down any fresh bird that has made its appearance in my garden. Several of my correspondents have adopted my plan, and we have exchanged lists to our mutual benefit.

LIST No. I.—BISHOP'S LYDFARD, WEST SOMERSET.

Birds observed in the Vicarage grounds at Bishop's Lydeard, West Somerset, between 1870 and 1880.

Bishop's Lydeard, at hardly any elevation above the sea, is situated at the western end of Taunton Dene, a celebrated breadth of rich meadow and pasture. Immediately to the north-west of the village the Quantock Hills rise some 1200 feet, opposing a barrier in the direction of the Bristol Channel about twelve miles distant. The Vicarage gardens, with a meadow adjoining, contain about eight acres; a warm ditch at one side was seldom without a Snipe in frosty weather, and enabled such species as Woodcock and Green Sandpiper to be included in the list. There was no large wood near, and the village brook was half a mile to the south.

B, after a species, signifies that its nest was observed.

| | | |
|----------------------|------------------------|---------------------------------|
| Mistle Thrush, B. | Red-backed Shrike, B. | Green Woodpecker. |
| Song Thrush, B. | Spotted Flycatcher, B. | Kingfisher. |
| Redwing. | Swallow, B. | Cuckoo. |
| Fieldfare. | House Martin, B. | White Owl. |
| Blackbird, B. | Sand Martin. | Tawny Owl. |
| Wheatear. | Greenfinch, B. | Sparrow Hawk. |
| Redstart, B. | Hawfinch. | Peregrine Falcon, passing over. |
| Black Redstart. | Goldfinch, B. | Kestrel. |
| Redbreast, B. | Siskin. | Heron, passing over. |
| Whitethroat, B. | House Sparrow, B. | Mute Swan, ditto. |
| Blackcap, B. | Chaffinch, B. | Wild Duck, ditto. |
| Golden-crested Wren. | Brambling. | Ring Dove, B. |
| Chiffchaff, B. | Linnet, B. | Turtle Dove. |
| Willow Wren, B. | Lesser Redpoll. | Pheasant. |
| Hedge Sparrow, B. | Bullfinch. | Partridge. |
| Long-tailed Tit. | Corn Bunting. | Land Rail, B. |
| Great Tit, B. | Yellow Bunting, B. | Water Rail. |
| Coal Tit. | Reed Bunting. | Moor Hen. [over. |
| Marsh Tit. | Starling, B. | Golden Plover, passing |
| Blue Tit, B. | Jay. | Lapwing, ditto. |
| Nuthatch, B. | Magpie. | Woodcock. |
| Wren, B. | Jackdaw. | Snipe. |
| Tree Creeper. | Raven, passing over. | Jack Snipe. |
| Pied Wagtail, B. | Carriion Crow. | Green Sandpiper. |
| Grey Wagtail. | Rook. | Curlew, passing over. |
| Tree Pipit. | Sky Lark. | Common Gull, ditto. |
| Meadow Pipit. | Swift. | |

Total birds observed, 80; total birds nesting, 28.

Notes.—Besides the Birds on the above list, escaped Parrots of two species visited the garden without being secured; and a wandering Peacock spent several days with us, and then left again.

BLACK REDSTART.—Only one example seen at the beginning of March; this proved a young male of the preceding year, and was in the *Ruticilla cairii* plumage.

HAWFINCH.—A winter visitor, frequenting the gardens until April, and then departing just when we were hoping they would nest.

SISKIN.—A cage containing two tame Siskins was hanging near an open window, when one day a small flock of wild ones visited them, several coming into the room, the rest remaining on an acacia just outside.

Although the Cirl Bunting was not uncommon in the district, and was several times noted just outside my bounds, I was never able to include it in my garden list.

LIST No. II.—ST. LAWRENCE, PEMBROKESHIRE.

Birds observed at Stone Hall, in the parish of St. Lawrence, Pembrokeshire, between 1880 and 1888.

Here the elevation was about 250 feet; the gardens and shrubberies extended to about twelve acres, with small woods adjoining. In the garden was a small stream and an old fish-pond; below the house, a quarter of a mile distant, ran a good Trout stream. The sea, at St. Bride's Bay, was five miles to the west; the general character of the surrounding country was moory, with patches of meadow and arable land.

| | | |
|-------------------------|------------------------|--------------------|
| Mistle Thrush, B. | Dipper, B. | House Martin, B. |
| Song Thrush, B. | Long-tailed Tit, B. | Sand Martin. |
| Redwing. | Great Tit, B. | Greenfinch, B. |
| Fieldfare. | Coal Tit, B. | Goldfinch, B. |
| Blackbird, B. | Marsh Tit, B. | Siskin. |
| Wheatear. | Blue Tit, B. | House Sparrow, B. |
| Redbreast, B. | Wren, B. | Chaffinch, B. |
| Whitethroat, B. | Tree Creeper, B. | Linnet, B. |
| Blackcap, B. | Pied Wagtail, B. | Lesser Redpoll. |
| Golden-crested Wren, B. | Grey Wagtail, B. | Bullfinch, B. |
| Chiffchaff, B. | Tree Pipit. | Yellow Bunting, B. |
| Willow Wren, B. | Meadow Pipit. | Reed Bunting. |
| Icterine Warbler. | Spotted Flycatcher, B. | Starling, B. |
| Hedge Sparrow, B. | Swallow, B. | Jay, B. |

| | | |
|----------------------|------------------------------|-----------------------------|
| Magpie, b. | Tawny Owl, b. | Pheasant, b. |
| Jackdaw, b. | Sparrow Hawk, b. | Corn Crake, b. |
| Raven. | Peregrine Falcon. | Water Rail. |
| Carrion Crow, b. | Kestrel, b. | Moor Hen, b. |
| Rook. | Cormorant. | Golden Plover. |
| Sky Lark. | Heron. | Lapwing. |
| Swift. | Bean Goose, passing over. | Woodcock. |
| Nightjar. | Wild Duck, b. | Snipe. |
| Wryneck. | Teal. | Curlew, passing over. |
| Green Woodpecker, b. | Tufted Duck. | Common Gull, ditto. |
| Kingfisher. | Ring Dove, b. | Herring Gull, ditto. |
| Cuckoo. | Turtle Dove. | Lesser Black-backed |
| White Owl, b. | | Little Grebe. [Gull, ditto. |

Total species observed, 80; total species nesting, 45.

Notes.—CHIFFCHAFF AND WILLOW WREN.—One summer thirteen nests of Chiffchaff and two of Willow Wren were detected in the grounds, probably the relative numerical proportion of the two species in North Pembrokeshire. Both nests of the Willow Wren were lined with the small feathers of the Heron, numbers of these birds frequenting the pond on the lawn near which the nests were found.

ICTERINE WARBLER.—Was detected by its beautiful song in the spring of 1886. Many people used to come to listen to the bird, which I frequently saw while in song. As it remained for weeks, it might have had a mate and nest. It did not return the following year.

TITS.—As there were numerous evergreens in the plantations, all the species of Tit were abundant, and some beautiful nests of the Long-tailed Tit were found: one, in an oak, was constructed of dead oak-leaves mixed with the glaucous lichen from the trunk of the tree; another, in a willow overhanging the stream, was built of green moss, in which were worked numerous short and bright feathers from the Cock Pheasant.

CARRION CROW.—This bird was a pest, flocking into the shrubberies to nest from the bare country round. One spring I waged war against them, and destroyed over twenty nests, getting a fine series of nearly one hundred eggs.

WRYNECK.—Was only once seen on passage in April.

TAWNY OWL.—Semi-domesticated and very tame; nesting every year in old pigeon boxes against the house; and in old Crows' nests.

TURTLE DOVE.—Only one seen late in October.

TUFTED DUCK.—A single example visited the pond on lawn.

WOODCOCK.—Often flushed in kitchen-garden and in shrubberies. A small plantation of two acres adjoining the house was one morning beaten through, when fourteen were flushed.

By the side of the stream below the house the Common Sandpiper was regularly seen in the spring working its way to its nesting-station on the moors; and the Wood Sandpiper was once identified. Close outside the confines of the grounds Snipe occasionally nested, and both Whinchat and Stonechat; while Hen Harrier, Marsh Harrier, Buzzard, and Merlin were all noted.

Water Rails were common throughout the year, and it is believed that they occasionally nested in the shrubberies.

In one very severe spring, when snow lay on the ground until the middle of April, both Golden Plovers and Lapwings came into the garden; they were nearly starved, but would not eat the food put about for them.

Cormorants were frequently noted passing over, and were only too often found poaching in the Trout stream below.

LIST No. III.—BUCKLAND DINHAM, E. SOMERSET.

Birds observed in the grounds of the Vicarage, Buckland Dinham, East Somerset, between 1888 and 1897.

The parish of Buckland Dinham is in the East of Somerset, three miles north of Frome, and only three miles from the borders of Wilts. It stands 420 feet above the sea-level on a hill which rises gradually above it to over 600 feet. It contains rich meadows and pastures, and some of the finest Cheddar cheeses are made in the dairies. A large wood of over 200 acres is within half-a-mile; the local ornis is rich in Warblers and Woodpeckers. A small stream runs at the foot of the hill on which the village is built.

| | | |
|------------------------|-------------------------|------------------------|
| Mistle Thrush, B. | Blackcap, B. | Nuthatch. |
| Song Thrush, B. | Garden Warbler. | Wren, B. |
| Redwing. | Golden-crested Wren, B. | Tree Creeper, B. |
| Fieldfare. | Chiffchaff, B. | Pied Wagtail, B. |
| Blackbird, B. | Willow Wren, B. | Grey Wagtail. |
| Whinchat. | Hedge Sparrow, B. | Yellow Wagtail. |
| Redstart, B. | Long-tailed Tit. | Tree Pipit. |
| Redbreast, B. | Great Tit, B. | Meadow Pipit. |
| Nightingale. | Coal Tit, B. | Red-backed Shrike, B. |
| Whitethroat, B. | Marsh Tit, B. | Spotted Flycatcher, B. |
| Lesser Whitethroat, B. | Blue Tit, B. | Swallow, B. |

| | | |
|--------------------|----------------------|-------------------------|
| House Martin, B. | Magpie. | Peregrine Falcon, pass- |
| Sand Martin, B. | Jackdaw. | Kestrel. [ing over. |
| Greenfinch, B. | Rook. | Heron, passing over. |
| Hawfinch. | Sky Lark. | Bean Goose, ditto. |
| Goldfinch, B. | Swift. | Ring Dove, B. |
| House Sparrow, B. | Nightjar. | Stock Dove. |
| Tree Sparrow. | Wryneck, B. [pecker. | Turtle Dove. |
| Chaffinch, B. | Great Spotted Wood- | Pheasant. |
| Brambling. | Lesser Spotted Wood- | Partridge, B. |
| Linnet, B. | pecker. | Corn Crake, B. [over. |
| Lesser Redpoll. | Green Woodpecker. | Stone Curlew, passing |
| Bullfinch, B. | Cuckoo. | Lapwing, ditto. |
| Crossbill. | White Owl. | Brown-headed Gull. |
| Yellow Bunting, B. | Tawny Owl. | Herring Gull, passing |
| Starling, B. | Sparrow Hawk. | over. |

Total birds observed, 76; total birds nesting, 36.

Notes.—The absence of any pond or stream close at hand occasions this list, in spite of its greater richness in the Warblers and Woodpeckers, to contain fewer species than the preceding ones.

REDWING.—Has not been seen for the last five years, and from some cause appears to have deserted the immediate neighbourhood.

NIGHTINGALE.—Only occasionally seen in the shrubberies, and does not nest; the situation is apparently too high for it. About a mile away, in thick hedges on lower ground, it is numerous.

Just outside my bounds several other Warblers, not included in the list, are common; these are Wood Wren, Sedge Warbler, and Grasshopper Warbler. Sitting on the lawn one beautiful midsummer night, at least half-a-dozen Grasshopper Warblers were heard "reeling." It was between ten and eleven o'clock, and the village had become hushed in quiet, when first one of these little Warblers began to "reel" in the valley below; another soon started singing, and then another, until their song was heard proceeding from all directions. I have twice identified the Marsh Warbler by the side of the *Vallis* brook, about a mile to the south of us; on one occasion I watched the bird while it was singing in a poplar by the side of the water.

SAND MARTIN.—Has been detected nesting in some holes left in the garden-wall where scaffold-poles were once inserted.

HAWFINCH.—Rarely seen in the garden in summer; a pair or two nest annually in the parish; the village boys have taken the eggs.

TREE SPARROW.—Has only twice been identified in the garden, and does not appear to nest with us.

LESSER REDPOLL.—A brood of young birds seen in the garden were supposed to have been reared there; nests and eggs have been taken close at hand.

CROSSBILL.—A small flock, about fourteen or fifteen; two broods got together and probably reared at no great distance; visited an avenue of Scotch firs in August, 1894; and early in July in the following year a flock of about the same size attacked the ripe raspberries.

GREAT SPOTTED WOODPECKER.—Nests annually in Orchard-leigh Park, about a mile distant, always selecting a lofty abele, and excavating its nest in the trunk at a great height from the ground.

STOCK Dove.—Has only once been seen.

BROWN-HEADED GULL.—One spring about half-a-dozen appeared in the meadow before the house; others were seen flying about. They were probably a detachment from some gullery questing about for a new breeding station. Small flocks have been noted passing over at various times, one at the end of July this present year. We are thirty miles from the Bristol Channel, and about sixty from the nearest gullery near Wareham, in Dorset.

NOTES AND QUERIES.

MAMMALIA.

Mammals of Trinidad.—Dr. Percy Rendall's notes on this subject in last month's 'Zoologist,' pp. 341-345, are evidently largely based on experiences in a locality where it was my privilege to collect during March and April, 1893, and I have therefore read them with unusual interest. His capture of *Dasyprocta cristata*, Desm., struck me as one of especial importance, for I had previously supposed this animal to be restricted to the Lesser Antilles, where its presence has been considered to have a significant bearing on the relation of the fauna of these islands to that of the mainland. I find, however, that the Agouti has been previously recorded from Trinidad by Dr. Sclater,* on the basis of two animals presented to the Zoological Society's Gardens in 1885 by T. J. Guy, and one presented in 1891 by R. J. L. Guppy. Both of these presentations were unknown to Dr. Allen and myself when writing our list of the mammals of Trinidad,† and I take this opportunity to acknowledge and correct an oversight. In stating that there are but "three marsupials found in Trinidad," Dr. Rendall has evidently overlooked *Thylamys carri*, described by Dr. Allen and myself from three specimens taken at Caparo in March, 1894.‡ Here also, as in other parts of the island, I found *Heteromys anomalus* abundant, and not of "local" distribution. Sixty-nine specimens were taken, and the animal was apparently as common in the mountains at Caura as in the lowlands of Savanna Grande.—FRANK M. CHAPMAN (American Museum of Natural History, New York).

RODENTIA.

"The Seasonal Changes in the Common Squirrel."—Those who read Mr. Thomas's remarkable paper with this title, published in 'The Zoologist' for 1896, at pages 401-407, will be interested to learn that sixty years earlier the late Edward Blyth appended a striking note on the same subject

* 'List of the Vertebrated Animals now or lately living in the Gardens of the Zoological Society of London.' Ninth edition, 1896, p. 182.

† 'On a Collection of Mammals from Trinidad, with Descriptions of New Species.' Bull. Am. Mus. Nat. Hist. v. 1893, pp. 208-284.

‡ 'On a Second Collection of Mammals from the Island of Trinidad, with Descriptions of New Species, and a Note on some Mammals from the Island of Dominica.' Bull. Am. Mus. Nat. Hist. ix. 1897, pp. 18-30.

to his edition of White's 'Selborne' (London, 1836, pp. 280, 281, note). It may be here transcribed:—"The changes of appearance which the Common Squirrel undergoes have not been noticed in any work that I have met with. They shed their covering twice in the year, and in summer the ornamental ear-tufts are entirely wanting; the whole fur also is then much coarser, more shiny, and redder; and it is a curious fact that those young ones born in early spring are first clad in the winter livery (which, I believe, they do not the first summer exchange), while the second litters, which are produced about midsummer, are decked in the summer coat, and have no ear-pencils." On comparison it will at once be remarked that some of the conclusions arrived at by Mr. Thomas are not quite so novel as their accomplished author at the time supposed. It would be of interest to have further light cast upon the "curious fad" with which Blyth concludes his note, and it is to be hoped some reader will be able to do this.—W. RUSKIN-BUTTERFIELD (St. Leonards).

A V E S.

Honey Buzzard in Suffolk.—A remarkably fine specimen of the Honey Buzzard, *Pernis apivorus*, was shot in Bull's Cross Wood, on the Edwardstone Hall Estate, about four and a half miles south-east of Lavenham, in Suffolk, on or about July 1st, by a gamekeeper, who mistook it, in thick covert, for a Wood Pigeon. It is in perfect adult plumage, having the lower parts almost entirely white, and has been preserved by Mr. Travis, taxidermist, Bury St. Edmunds, in whose shop Mr. J. H. Gurney and I had the pleasure of examining it shortly after it was mounted.—E. A. BUTLER (Brettenham Park, Ipswich).

Golden Eagle in Ross-shire.—A fine specimen of the Golden Eagle, two years old, and measuring 36 in. in length, and over 7 ft. in expanse of wings, and weighing 11 lb., was caught a few days ago in Ross-shire, and has been sent to me to be preserved.—JOHN MORLEY (King Street, Scarborough).

Nesting of the Great Northern and Black-throated Divers in Shetland.—The August number of 'The Zoologist' contains two very important statements by Mr. Bernard A. E. Buttress. The first occurs in his "List of Birds observed in Shetland, May and June, 1897" (p. 362), and is in these words: "*Colymbus glacialis*. One pair near Clonstel. Eggs found." As the Great Northern Diver has not, up to the present time, been satisfactorily proved to breed in any part of the British Islands (although strongly suspected of doing so), I hope Mr. Buttress will not withhold further particulars of this interesting and important occurrence. The second statement (p. 364) is to the effect that eggs of the Black-throated Diver have been taken several times in Shetland by a resident, and that an undoubted

egg taken by him in 1896 is in Mr. Buttress's possession. This species does not figure in the list of birds observed by Mr. Buttress in 1897, a fact that may possibly be accounted for by the fact that the discoverer of the eggs has more than once shot the birds off the nest. Saxby, during his long residence in the Shetlands, never saw the Black-throated Diver there; and, according to Mr. Howard Saunders, "this species has not . . . been identified in the Shetlands at any season" ('Manual,' p. 698). Seeböhm stated that large examples of the eggs of the Black-throated Diver cannot be distinguished from small eggs of the Great Northern Diver, nor small examples from large eggs of the Red-throated Diver ('History of British Birds,' vol. iii.). The hitherto unsuspected presence of *C. arcticus* as a breeding species in the Shetlands, therefore, if fully proved, makes the paternity of some supposed Northern Divers' eggs taken in those islands more doubtful than ever.—O. V. APLIN (Bloxham, Oxon).

Black-throated Diver in Derbyshire.—In January or February of this year a Black-throated Diver was shot on Combs* Reservoir, near Chapel-en-le-Frith, by a man named Peter Muir. The bird is in immature plumage, the feathers of the upper parts being edged with pale slate-grey, and the white plumage of the chin, throat, and sides of the head is slightly suffused with brown. The following measurements will be sufficient to distinguish the bird from the Great Northern Diver, a species more frequently met with inland:—Wing, 11·9 in.; length of bill, 1·8 in.; depth of bill at nostril, ·65 in.—CHAS. OLDHAM (Sale).

Spotted Flycatcher's Nest constructed in Nest of Hawfinch.—I am forwarding you a this year's Hawfinch's nest with a Spotted Flycatcher's nest built inside, as I was not aware that Spotted Flycatchers built in other birds' nests. I found the Hawfinch's nest in the fork of a whitethorn bush in Wychwood Forest on May 26th, with the egg-shells lying on the ground under the nest. They had been sucked either by Cuckoos or Jackdaws. These birds appeared to be sucking every egg that was laid, for nearly every nest of eggs had shared the same fate, both Cuckoos and Jackdaws being very numerous. When passing the same spot on June 28th, I noticed a Spotted Flycatcher sitting on the same nest, which looked somewhat different. On climbing up to the nest I discovered that it contained two eggs. Feeling certain that these eggs would share the same fate as the last, I took one (which I now send you) of the two eggs, with the result that when I passed the place the following week the remaining egg was sucked.—R. U. CALVERT (Ascott-sub-Wychwood, Oxford).

* I desire to substitute the word "Combs" for "Coombs" at p. 329, line 7 from bottom.

Proximity of Magpie's and Wood Pigeon's Nests.—On June 18th I noticed a rather unusual coincidence in Fyfield Wood, Oxon. There was a Magpie's nest situated in a slender birch tree, containing four young ones nearly ready to fly, and close by was a sapling oak, in the upper part of which was placed a Wood Pigeon's nest containing two hard-sat eggs, off which the old bird flew. The two nests could not have been three yards apart at the most.—R. U. CALVERT (Ascott-sub-Wychwood, Oxford).

Hedgesparrow appropriating a Thrush's Nest.—A short while ago a little girl showed me a Hedgesparrow's nest with eggs which she found this season in rather an unusual situation. The locality was Monkton Combe, about five miles from Bath. Both nests were about the usual size, and completely finished. I have come across a Wren's nest in a similar situation, but was surprised to find a Hedgesparrow having utilised another bird's nest in the above manner. In 'The Zoologist,' 1895, p. 275, there is a note concerning a pair of Greenfinches having appropriated a Thrush's nest, and rearing a brood successfully.—C. B. HORSBRUGH (4, Richmond Hill, Bath).

White Eggs of Hedgesparrow.—Early in the season a boy, much interested in birds and their eggs, brought me an egg taken from a nest built in a hedge of thorn and holly. The egg was perfectly white and shining, reminding one forcibly of eggs of the Lesser Spotted Woodpecker, and not of that chalky whiteness we find in eggs such as the Swift's. The boy told me the nest contained three other eggs, and a few days after he informed me another had been laid, exactly similar, and that the bird—a Hedgesparrow—was sitting upon them. Strange to say, the bird was unmolested, and hatched three of the eggs, the other being addled; and when the young were flown the boy brought me the nest as a proof of his observation and veracity.—G. B. CORBIN (Ringwood, Hants).

Lesser Grey Shrike (*Lanius minor*) in Kent.—I am pleased to be able to record another occurrence of this very rare visitor to this country, which I observed on May 15th last on the range of hills in mid-Kent, while in company with my friend Mr. John Wood. As we passed under an ash-tree I heard a strange note overhead, and, looking up, I saw a bird fly out with a rather jerky flight, and uttering short notes, resembling, as well as I can remember, the sounds "chur-tic, chur-tic, tic." These notes were new to me, and from the appearance of the bird, as seen against the background of brilliant blue sky, I was quite at a loss to make out the species; but it soon dipped down, and its striking colours became visible against the hill under which we were standing. The bird then alighted on the ground for a few seconds, when I brought my friend's field-glasses to bear on it, which at once revealed the pattern and richness of its plumage. I then instantly knew

what a rarity I was watching ; the silvery grey, deep black and white of the upper parts, and the delicate pink breast and flanks, looked particularly rich in the sunlight, and in strong contrast with the turf on which it stood. It then flew up and perched on a small hawthorn, from that again to the ground, and then on to a furze-bush. After two or three such movements it disappeared over the brow of the hill. After waiting a short time I saw it again further along the hill-side, chasing a smaller bird, I think a Linnet ; but the distance was too great to make sure of the species, though the colouring of the Shrike was plainly visible. From the intensity of the black markings it was clearly a male. I think it very probable that it had taken up its abode on the hill for nesting purposes, for which the character of the place was admirably adapted ; and if opportunities had been afforded, I intended paying another visit to the ground later on, with the hopes of seeing more of the bird and perhaps its nest. — F. W. FROHAWK (34, Widmore Road, Bromley, Kent).

“Kentish Crow.” — Your correspondent, Mr. L. C. Farman (*ante*, p. 356), mentions “Kentish Crows” visiting the Norfolk fens. I should be very glad to know the scientific name of these birds, as the term is new to me. — C. B. HORSBRUGH (4, Richmond Hill, Bath).

[The Crows to which I referred were Hooded or Grey Crows, *Corvus cornix*. These are known all over Norfolk as *Kentish Crows*, and remain with us in quantity throughout the winter. — LAST C. FARMAN.]

Crossbills near Bournemouth. — Scarcely a winter passes without this varied plumaged and interesting species occurring in greater or less numbers—sometimes not uncommonly—in the neighbourhood of Ringwood and the New Forest, and on one occasion I saw a small flock of eight or ten busily engaged in discussing the cones which grew on a few Scotch firs not far from Salisbury ; but I was somewhat surprised and unprepared to detect its presence near Bournemouth at the end of July. Enforced idleness, caused by indisposition, compelled me to seek change in the beautiful health-giving pine-woods of Branksome and its neighbourhood, where on the sandy heather-clad slopes the Lizards panted, or glided silently along in the hot sunshine, and over them flitted the “grayling” (*Satyrus semele*) in some abundance, accompanied by a few common blues (*Lycæna bellargus*), and small coppers (*Chrysophanus phlaeas*), or the tiny fry of *Crambus pinetellus*, *Endotricha flammealis*, and other moths of a still lesser bulk. One morning, whilst seated underneath a tree, my attention was taken from the book I was perusing to the notes of some bird which were unfamiliar to my ear, although a number of Sparrows, Tits, and Warblers were chirping and singing in the branches above me. Looking up in the direction from whence the sound proceeded, I could see two or three birds in the tree-tops, but the thickness of the foliage and the bright light shining between the

open spaces prevented my detecting even what colour they were, much less what species they belonged to, although the thought crossed my mind, Can they be Crossbills, and are the notes I am listening to the same as Longfellow calls " Songs, like legends, strange to hear"? I, however, was not long in doubt, for one of the birds descended from the tree in pursuit of a fallen cone, and there on the white sandy soil, only a few paces from me, was a beautiful specimen of the bird, in the orange-red plumage, with "marks of blood and holy rood," as the translated legend informs us. I was much interested in the occurrence, and in almost breathless silence watched it tear the cone to pieces—in a very parrot-like fashion—with its beak, holding the cone in position with one of its feet. I think I have read somewhere that the beak of this bird has been considered a deformity of nature, but the ease and dexterity with which the instrument was used on this occasion proved, I thought, its adaptability as a "means to an end." I watched the bird closely until it flew away to its companions in the branches above, and then I went and picked up the small cone upon which it had been working so intently, and found that the scale-like processes of the cone had merely been torn asunder (not severed from the central "core," as a Squirrel does its work), so that the immature seeds could be extracted by the scissors-like beak. I saw a number of male cones scattered beneath the trees similarly treated, but I am not at all prepared to state that Crossbills were the cause of their mutilation, for, strange to say, although I daily visited the spot both before and after the occurrence, I only once heard the birds, and did not see them again. I think I have heard that the species has been detected nesting in this particular neighbourhood, and although perhaps my present observation proves nothing either for or against that fact, yet it is interesting to know that a species we usually connect with more northern localities should occur so far south in the middle of summer; and yet it seems to me its occurrence here at such a time is not frequent, or else some of our ornithological peers (many no doubt visiting this well-known locality every season) would not have been silent on the point, and left it to my poor pen to describe. Of course it goes without saying that the majority of the cones were in a very unripe state, and consequently with seeds quite undeveloped, and perhaps that was partly the cause why the birds stayed so short a period in one particular spot. While wandering about in the woods one thing was very apparent, *viz.* the comparative abundance of the House Sparrow and the scarcity of the Squirrel (for one naturally expects to find this little rodent amongst its much-loved fir trees, especially as it is so common only a few miles away); but this seeming anomaly may be met in the fact of so many houses having sprung up in unlooked-for situations amongst the trees. As we are well aware, the bird delights in the proximity of human habitations, whilst the quadruped shuns them; or it may be that the scarcity of the latter is partly attributable to the

presence of the numerous children—naturally full of young life and fun—who, with bags and nondescript hand-carts, gather the fallen cones for fuel.—G. B. CORBIN (Ringwood, Hants).

Unusual Sites chosen by Birds for their Nests.—The following instances have come under my notice this season:—1. A Chaffinch built her nest early in the summer, and reared her young in an old Swallow's nest which was fixed on a beam in a field shed. 2. A Great Tit laid four eggs in the cup of a Blackbird's nest, apparently of this season, and brought off her young. She lined the larger nest with the usual mass of hair-felt. The Blackbird's nest was in the fork of a yew-bough, some four or five feet from the stem, and about four feet from the ground. The young appeared newly hatched when I saw them on June 16th. Probably the Tits had lost their first nest, and could not find a suitable cavity unoccupied when they went to nest again. But this reason can hardly account for the curious freak of the Chaffinches, who could have had no difficulty in finding plenty of convenient positions.—W. H. ST. QUINTIN (Scampston Hall, York).

Birds nesting in August.—Last year I contributed a note (Zool. p. 303) recording some thirty nests found in the course of a few hours on Aug. 3rd in Cambridgeshire. This year, on Aug. 2nd (Bank Holiday), I was in the same locality, and in about three hours found the following:—Twelve nests of Turtle Dove, ten nests with eggs, two with young; two nests of Ring Dove, both with young; three nests of Yellowhammer, all with eggs; one nest of House Sparrow in a hawthorn-bush only five feet from the ground, with four fresh eggs; one nest of Red-legged Partridge, with three eggs in hatched-out nest; one nest of Meadow Pipit, with four eggs; one nest of Reed Bunting, with three young and one infertile egg; two nests of Linnet, with eggs, one set fresh, the other hard-sat; two nests of Greenfinch, with eggs, both sets fresh. Two years ago I found a Blackbird's nest, with five fresh eggs, in the same neighbourhood, and heard of two Partridges' nests, on which the old birds were still sitting, the first week in August. The Yellowhammer, I should say, sometimes rears three broods in the year, for I have found, even in Scotland, newly-hatched young as early as April 19th. The earliest date I have for the Reed Bunting is a full set of five eggs on April 20th.—R. H. READ (Bedford Park, W.).

Birds seen in the Yukon District of Canada.—The following is extracted from a report of Mr. W. Ogilvie (Dominion Land Surveyor):—“Birds are scarce. A few Ravens were seen along the river [Yukon], and three or four remained in the vicinity of the boundary all the winter. They were generally more active and noisy on stormy days than at other times, and their hoarse croak had a dismal sound amid the roar of the elements.

A few Magpies were seen near the Nordenskiold river" [a tributary of the Lewes river], "and a few White-headed Eagles were noticed. During the winter, near the boundary, numbers of small birds, somewhat resembling the 'Chick-adee,' were seen, but they were much larger, and had not the same note. Of Owls, not a specimen was met with anywhere. Partridges were very scarce, only half a dozen or so of the ordinary kind being noticed; but at the head of the Tat-on-duc and Porcupine rivers Ptarmigan were abundant. Wild Geese and Ducks are plentiful, and of Ducks there are many more species than I have seen in any other part of the territory. A very beautiful species of Loon or Diver was met with on the Porcupine. It is smaller than the Great Northern Diver, but marked much the same on the body, the difference being principally in the head and neck; the bill is sharper and finer, and the head smaller, but its chief distinguishing feature is the neck, which is covered with long beautiful dun-coloured down for more than half its length from the head downwards." [This bird was probably (?) the Red-throated Loon, *Urinator lumme*.]—BASIL W. MARTIN (39, Victoria Street, Westminster).

REPTILIA.

Smooth Snake (*Coronella lævis*) in the New Forest.—The late Canon Kingsley centred a peculiar interest on the probable occurrence of this reptile within the forest boundary, and often asked questions on that particular point, as he knew I had seen and taken it on the heaths on the other side of the river, near the spot where it was first discovered as an inhabitant of Britain; but it was only a short time before his lamented death that I could positively say I had seen it in the forest; then I was fortunate enough to catch one in the neighbourhood of Minstead, not far from the well-known Rufus stone. Since that time I have seen or known of a number of specimens from the district, especially during the great and continued heat of the summer of 1896. Two were seen—but not taken—near Sway; three specimens, an old female and two immature individuals, were taken very late in the season on the heaths between Beaulieu and Brockenhurst; and in August a nephew of mine whilst entomologizing caught one near Boldre Wood, and brought it to me thinking it was an Adder (*Pelias berus*). Strange to say, the same lad caught another, almost on the same spot, this season, at the end of July, but so mutilated it that it was worthless to preserve. It seems a pity to destroy the poor little harmless creature whose movements amongst the heather are so graceful and interesting, and whose body, especially the under parts, shine with an iridescent gloss in the hot sun, and when taken in the hand the keelless scales which envelope its body make it feel cold and smooth to the touch, like an eel. My comparatively limited experience of this particular species

has led me to suppose that it lacks the disagreeable smell which is sometimes so apparent in presence of the Common Snake (*C. natrix*), but I know on this particular point opinions differ.—G. B. CORBIN (Ringwood, Hants).

A M P H I B I A.

Enemies of the Toad.—An instance of a Weasel having been seen carrying a Toad in its mouth was recorded in the 'Field' a short time since by Mr. E. Stanford, Honiton, Devonshire. I cannot unfortunately recollect the exact date of its appearance, but believe it to have been about a year ago, more or less. I have myself seen a tame Hedgehog devour a Toad which was more than half grown. Doubtless there are very few mammals, and not many birds, which ever make a meal of a full-grown Toad. The Common Buzzard, however, is known to do so, and in the spring Rats make great havoc among Frogs and Toads alike in the marsh ditches. The vast armies of young Toads which, after completing their change from the tadpole state, leave the water and spread abroad over the face of the country, are beset by many dangers. Numbers are no doubt crushed by wheels and the hoofs of horses and cattle, while others fall a prey to rats, fowls, ducks, &c. I once saw a cock calling his hens together to partake of some choice morsel he held in his beak. This he afterwards dropped, and on picking it up it turned out to be a small Toad. A Corncrake caught by a dog near Orford, Suffolk, in August, 1887, when taken in the hand, disgorged a very young Toad, and immediately afterwards a Frog of much larger size.—G. T. ROPE (Blaxhall, Suffolk).

[Mr. J. H. Gurney (Zool. 1883, p. 303) states that Common Snakes prey chiefly on Toads, which he had found to form the most frequent contents of their stomachs.—ED.]

I N S E C T A.

Stridulation of Cicadidæ and Orthoptera.—In the Editor's excellent and interesting "Zoological Rambles" (p. 159) the following passage occurs:—"Protective resemblance can scarcely be a factor in the insect's existence when by its piercing notes it proclaims the place of its concealment. In collecting I was usually apprised of their whereabouts by their stridulating music." I should like to ask if this is the experience of observers generally. I have many times listened to the highly-pitched sounds emitted by Cicadas, Grasshoppers, Crickets, &c., in Africa and South America, and have often searched for a considerable time without being able to discover the whereabouts of the insects. In my experience a highly-pitched shrill sound, even when very loud, is most difficult to localize exactly, and I say this with the sounds uttered or made by both birds and insects in my mind. I remember one evening, when I was in Uruguay, an intensely loud and highly pitched or shrill Grasshopper's trill suddenly began in the room.

It was so loud and ear-piercing as to leave an unpleasant and irritating void in the ear when it momentarily ceased. Although the room was scantily furnished, in a manner suitable to a hot climate, several minutes elapsed before we could discover the large bright green grasshopper (about two inches long) which was producing the sound while perched in a conspicuous position. The sound gave us no idea of the direction from which it proceeded. Cicadas, crickets, &c., become silent (p. 160) if you approach them closely (not, however, when they are in a tree twenty feet or so overhead), but begin to trill again if you keep quite still.—O. V. APLIN (Bloxham, Oxon).

PRESERVATION OF ZOOLOGICAL SPECIMENS.

Dermestes lardarius eating Specimens of Moths.—Some weeks ago I set eight specimens of *Sphinx ligustri*, and in a few days I noticed that the bodies of the insects had been disturbed and the paper which covered the setting-boards had been eaten. I removed the insects, and from one of them there came out two *Dermestes lardarius* beetles; I examined every one of the *ligustri*, but found no more *Dermestes*. The *ligustri* were put into a store-box, and on looking at them a few days ago I found their bodies completely eaten away; so much so that with the slightest touch the wings came off and out rolled a number of the larvae of the *Dermestes*, a disgusting creature, and the greatest enemy of the zoological collector; but I have never before heard of their attacking entomological specimens. I have many thousands of butterflies and moths here, from all parts of the world, but this is the first time a *Dermestes* has given me any trouble in this direction.

NON-POISONOUS PRESERVATIVES.—Three years ago I made a trip to India for sporting and collecting purposes, and had the great misfortune to consult one of the leading firms of taxidermists in London, and following their advice I applied no poison to any of the skins and heads I got, with the result that when I reached home the specimens were swarming with *Dermestes*, and many quite spoilt. Now on former expeditions, of which I have made several, I have always poisoned my skins, &c., liberally, and not a single *Dermestes* has ever bothered me before. I should like to know what the experience of other sporting collectors is in this matter—to be able to dispense with poisons is very attractive, and has no doubt tempted many to do without them—but I wonder how they have got on. Every room in my house is filled with heads, skins, and preserved specimens of all sorts, most of which are poisoned, and none of which, I am thankful to say, have been touched. There is, however, clear proof that *Dermestes* is on hand, and how to guard against the ravages of his hairy larva with the appetite of a hog, and who is the incarnation of everything pestiferous, is a matter of considerable anxiety just now. Any hints or suggestions would be thankfully received.—C. DALLAS (Wootton, Lymington, Hants).

EDITORIAL GLEANINGS.

THE opening passage of Prof. L. C. Miall's Address to Section D. (Zoology) at the recent meeting of the British Association at Toronto will receive the hearty approval of most readers of 'The Zoologist':—"It has long been my conviction that we study animals too much as dead things. We name them, arrange them according to our notions of their likeness or unlikeness, and record their distribution. Then perhaps we are satisfied, forgetting that we could do as much with minerals or remarkable boulders. Of late years we have attempted something more; we now teach every student of zoology to dissect animals, and to attend to their development. This is, I believe, a solid and lasting improvement; we owe it largely to Huxley, though it is but a revival of the method of Döllinger, who may be judged by the eminence of his pupils, and by the direct testimony of Baer, to have been one of the very greatest of biological teachers. But the animals set before the young zoologist are all dead; it is much if they are not pickled as well. When he studies their development he works chiefly or altogether upon continuous sections, embryos mounted in balsam, and wax models. He is rarely encouraged to observe live tadpoles or third-day chicks with beating hearts. As for what Gilbert White calls the *life and conversation of animals*, how they defend themselves, feed, and make love, this is commonly passed over as a matter of curious but not very important information; it is not reputed scientific, or at least not eminently scientific."

DR. D. G. ELLIOT has contributed to the Zoological Series of the Field Columbian Museum, Chicago, a List of Mammals from Somali-land, obtained by the Museum's East African Expedition. One observation bears witness to the danger of a solely museum knowledge of an animal. *Madoqua phillipsi*, Thomas (Phillips's Dik-Dik), has a remarkable peculiarity in "the immense deposit in the antorbital vacuity of a black pigment, which stains everything it touches. It forms a swelling just in front of the eye, and from its jet-black colour and considerable size makes a very conspicuous mark. No trace of this exists in the skin, and as the skull shows a cavity at this point, no one would imagine that there would here be a prominence on the face instead of a depression. The lack of knowledge of such facts as this causes the mounted specimens in museums

to appear totally unlike the living animal—more caricatures than the real object—and I have never seen any drawing that correctly represented a Dik-Dik."

MR. A. W. MOORE and Dr. John Beddoe have recently written a paper on the "Physical Anthropology of the Isle of Man," which is published in the last issue of the *Journ. Anthropol. Instit.* A "Descriptive Book" of the "Royal Manx Fencibles," which contains the names of about 1300 men who passed through the ranks between 1803 and 1810, affords material for the memoir. From this number have been subtracted "all those under eighteen years of age (chiefly drummers), and those not born in the island, also all those whose names are either not Manx, or are not known in the island for a generation before 1800, even though they were born in the island." The book describes the complexion, eyes, hair, and stature, and it mentions the parish where each man was born and the trade to which he was brought up.

The results of this study are thus summarized:—"Generally speaking, they distinctly confirm Dr. Beddoe's conclusions that the population of the Isle of Man is Scandio-Gaelic, and that there is no very great difference in the proportionate distribution of Norsemen and Gaels in the north and south. Our results, however, enable us to state further that there appears to be a decided preponderance of Norsemen in the parishes of Jurby, Ballaugh, and Michael, and of Gaels in the parishes of Maughold and Louan, while there are distinct traces of alien elements in the districts of Douglas, Castletown and Peel, especially in the latter, where the large proportion of dark eyes and fair hair is very remarkable.

EVOLUTION seems to be now no longer a word of evil import. At the Catholic International Congress held at Fribourg in August, Dr. Zahm, of Indiana, and with the approval of the meeting, spoke as follows:—"As against the alternative theory of Creationism, the evidence, all must admit, is overwhelmingly in favour of evolution. I am quite willing to agree that as yet the theory is not proven by any demonstrative evidence. I freely grant that *à priori* Creationism is quite possible. But is it probable? Science answers 'No.' As to affording any positive evidence in favour of the special creation of species, it is absolutely mute; and the negative evidence is of such a character that there are few, if any, serious men of science who are willing to consider it as having any weight: *à priori*, Creationism is possible; *à posteriori*, it is so highly improbable as to be practically ruled out of court."

CONSIDERABLE public interest has been evinced by the importation of German Foxes into some parts of Bedfordshire. An 'Evening News' representative has interviewed Mr. G. Reuben Taylor, of Leadenhall Market, on the subject:—

"How a farmer can tell that they are German cubs,' said Mr. Taylor, 'is a wonder. There's no perceptible difference. A little lighter perhaps, but that distinction disappears when the cub gets older. Austrian cubs, now, are a bit shorter in the leg.'

"No, it's not the farmer who can tell; the person who will know is the unfortunate person who will hunt them. They don't run straight like an English Fox—they don't give the sport. As to their viciousness and destructiveness, they certainly are very vicious, but I doubt whether they are so destructive as Scotch and English cubs.'

"It seems that the only advantage possessed by the German cub is his cheapness. English or Scotch cubs two to five months old fetch fifteen to twenty-one shillings each; Germans from seven to ten. There is no great trade in English Foxes, because the Fox-hunting fraternity is a brotherhood in more than name, and comfort each other with superfluous hounds and Foxes.

"Scotch Foxes, Mr. Taylor said, form the staple supply. They come from mountainous parts, where hunting is impossible. During this season, commencing roughly May 1st, and terminating about the end of June, he has sold over three hundred Scotch cubs to only five English. The trade is of course now finished, and later on comes the time for old Foxes, and in these the relation between German and English as to price is the same. This year Mr. Taylor sold four Canadian cubs, and is awaiting results with considerable interest. They were exactly like the home article, and were, he avers, probably descendants of English ancestors. Whether a Fox be English, German, or any other nationality, he, it seems, invariably possesses the bouquet of Reynard in undiminished strength."

